

Improving Offensive Play Calling in the NFL

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DIFFICULTY OF OFFENSIVE PLAY CALLING



***Average tenure of play caller: 2.29 years**
263 hired since 2000

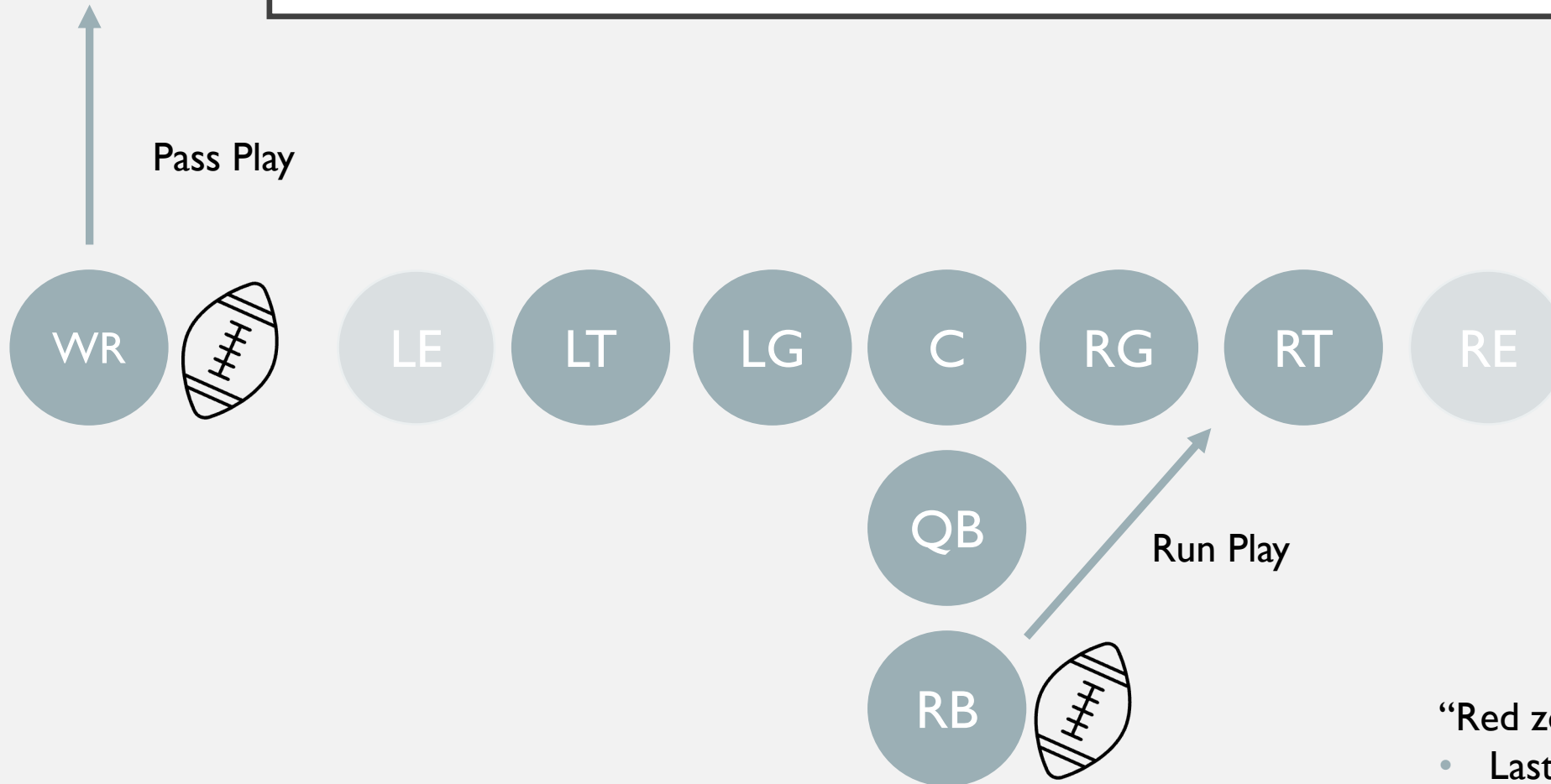


Only 40 seconds to
select each play



Hundreds of plays in
play book

QUICK TERMINOLOGY



“Red zone”

- Last 20 yards of opponent’s side of field
- 73% of 2017-2018 touchdowns occurred in red zone

CURRENT USE OF DATA IN THE NFL



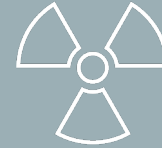
Pre-game Planning

Identify and exploit
trends in opponent
play style



Clock Management

Timeout Usage



Risk Assessment

Gauging success rate
of aggressive play call

EXPAND USE OF DATA

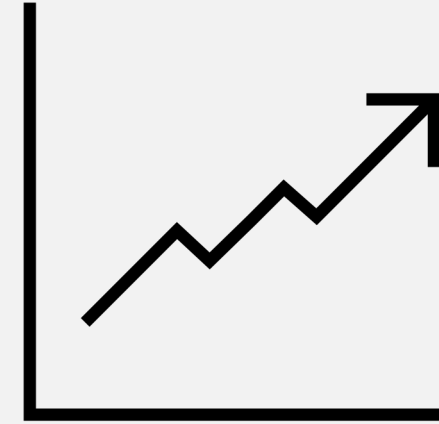
GOAL

Predict optimal offensive play call

SOLUTION

Build machine learning model to improve quality of offense by suggesting the optimal play call

- Used in real-time to validate play calling decisions
- Draws on insights from historical play-by-play data



-Yards per play
-Touchdown scoring chance

MODEL IMPLICATIONS

Assumptions

- Sole objective → maximize yards and touchdowns
 - Not concerned with negatively influencing opponents next possession
- Defense will not have equally sophisticated model

Risks

- Confirmation bias
 - Coaches reluctant to use model
- Limited effectiveness

Measures of Success

- Technical
 - % increase in offensive performance
- Non-technical
 - Level of adoption

METHODOLOGY

Data:

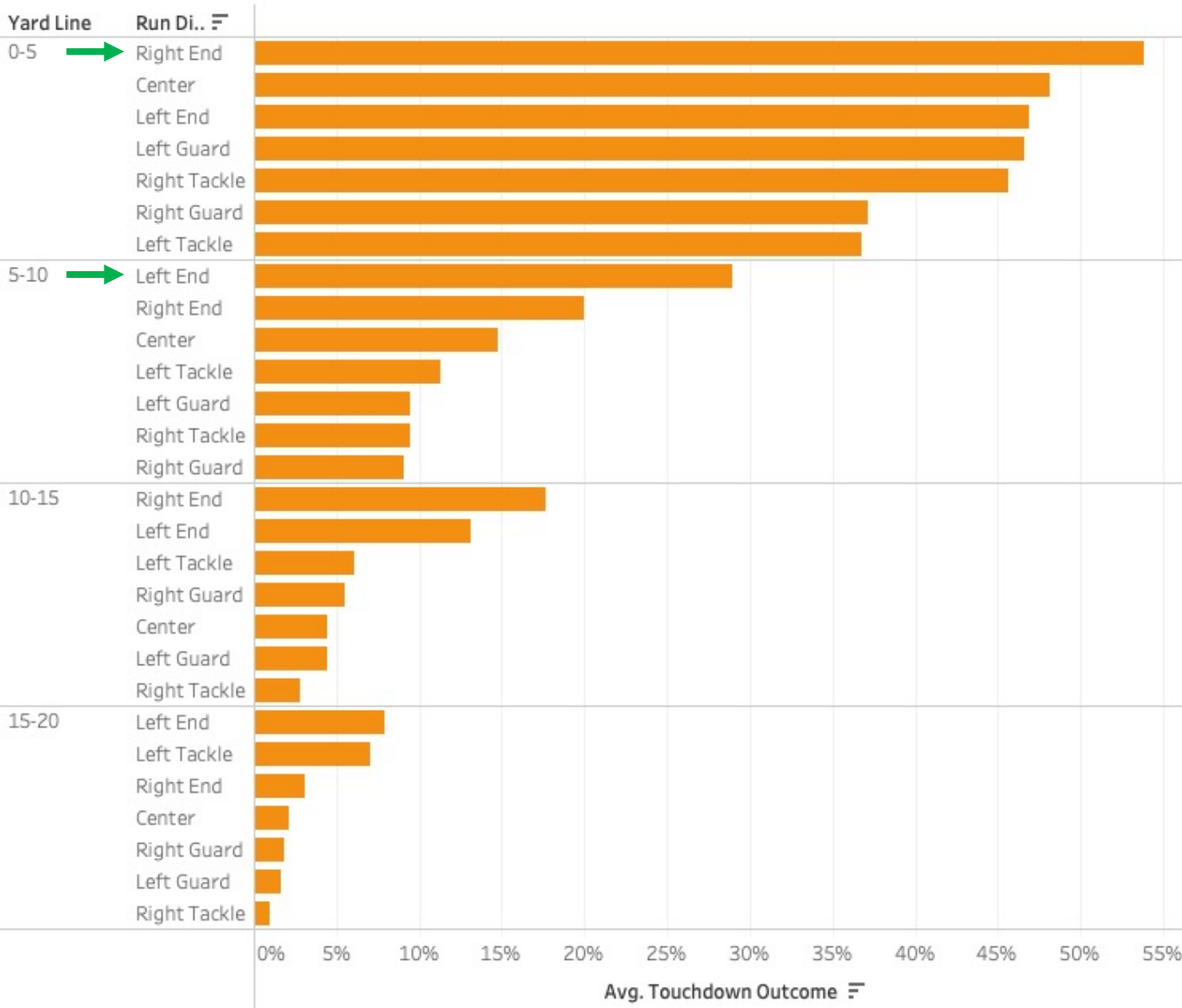
Play-by-play data from the 2017-2018 NFL regular season (90,069 plays)
Compiled by the Carnegie Mellon Sports Analytics Club



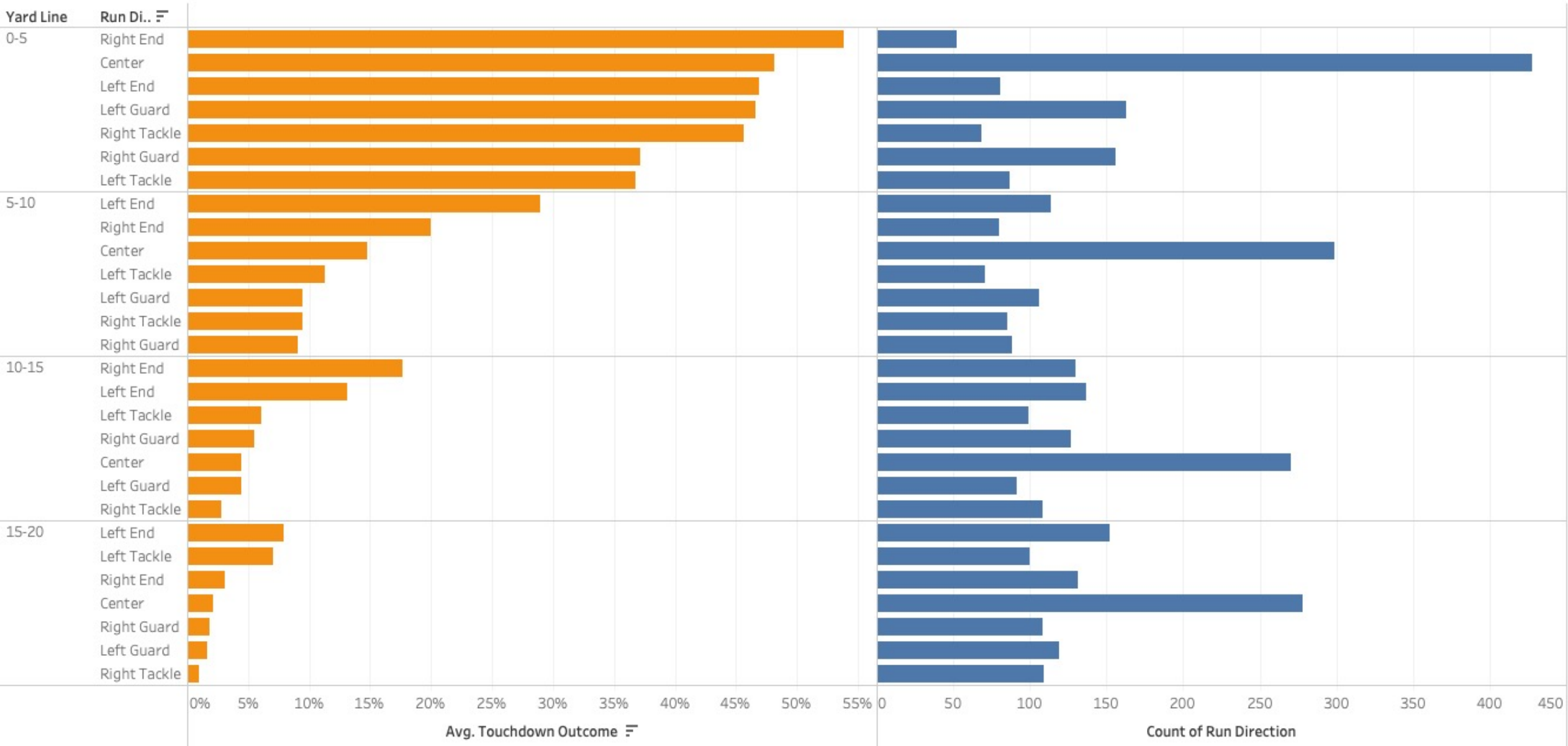
EDA:

Find league-wide trends in frequency of play type
Analyze outcomes of play calling decisions to find inefficiencies

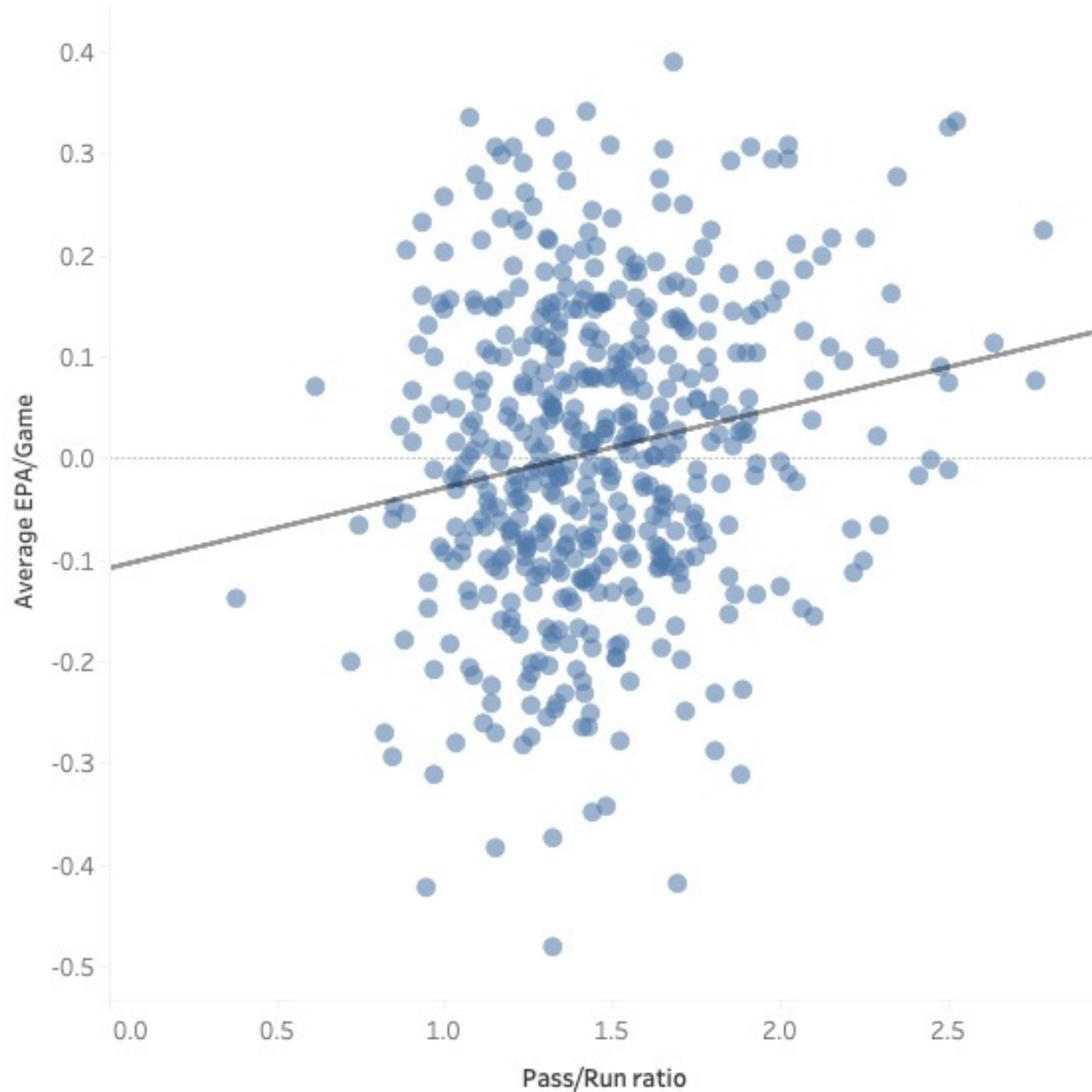
Average Scoring Outcome by Run Play Direction (Red Zone)



Average Scoring Outcome by Run Play Direction (Red Zone)



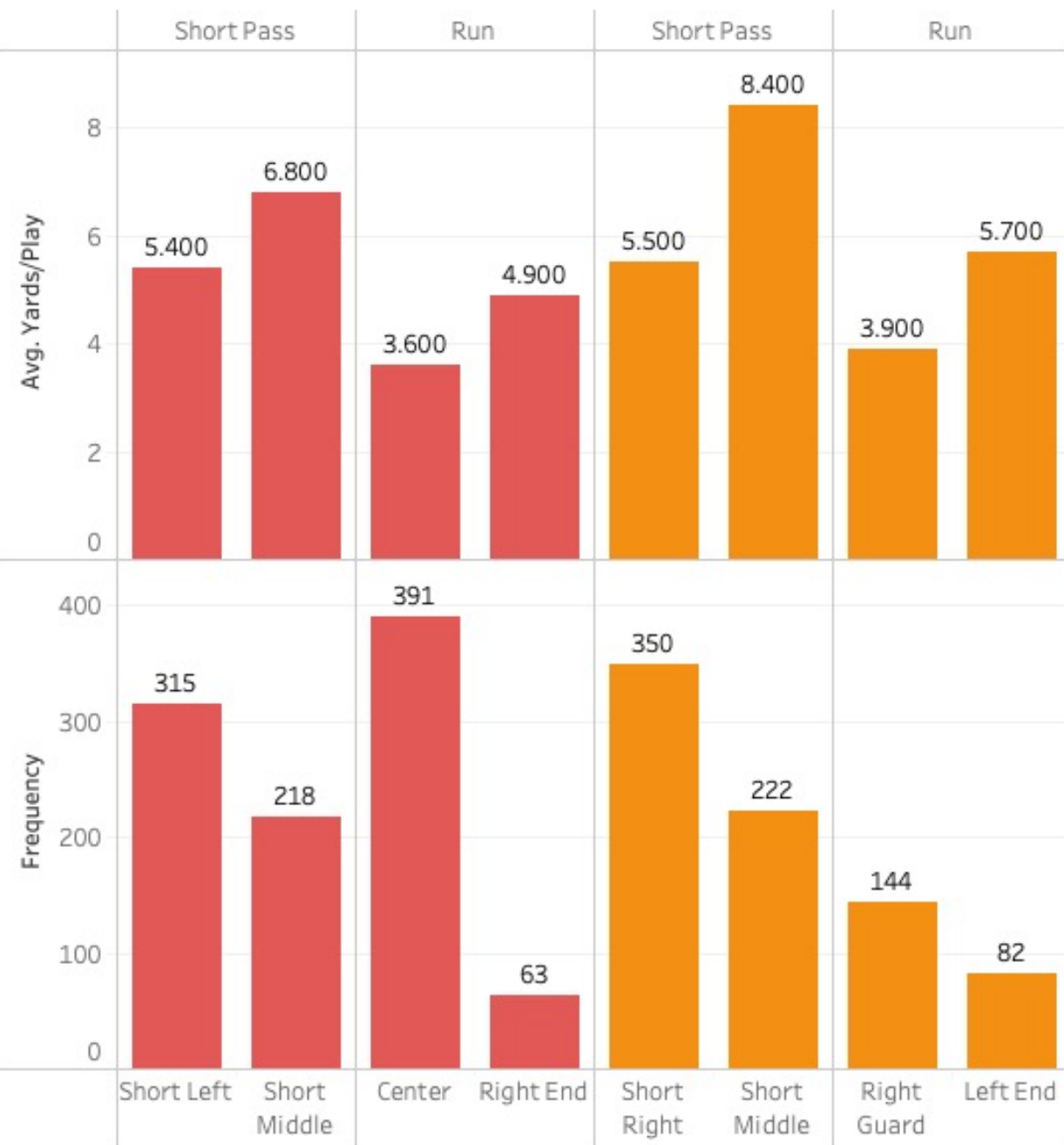
Average EPA/Game by Pass/Run Ratio



EPA: Expected Points Added

- Not all yardage is created equal
- Measures how each play effects changes to the score
- Based on down, distance, and field position
- Key feature in predictive model

Average Yards Per Play Type and Play Frequency



Team

Cardinals

Bengals

Struggling Teams

Cardinals:

- Pass: Increase short middle passes
- Run: Increase right end runs

Bengals:

- Pass: Increase short right passes
- Run: Increase left end runs

Successful Teams

- Maintain current play selection
- Incorporate higher yardage plays to increase variety

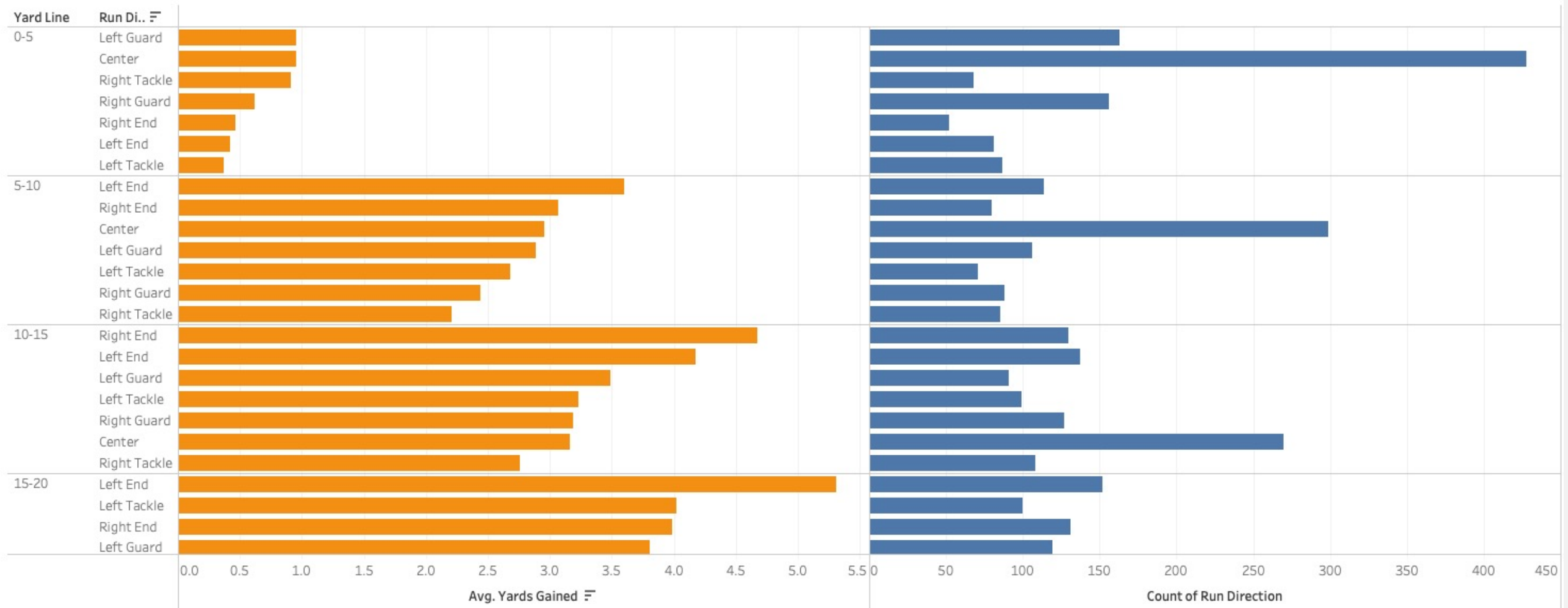
FUTURE WORK

- Explore personnel groupings to better understand missed opportunities
- Target key game scenarios to identify further trends
- Perform similar analysis on defensive statistics to determine need for improvement

Thanks for Listening!
Questions?

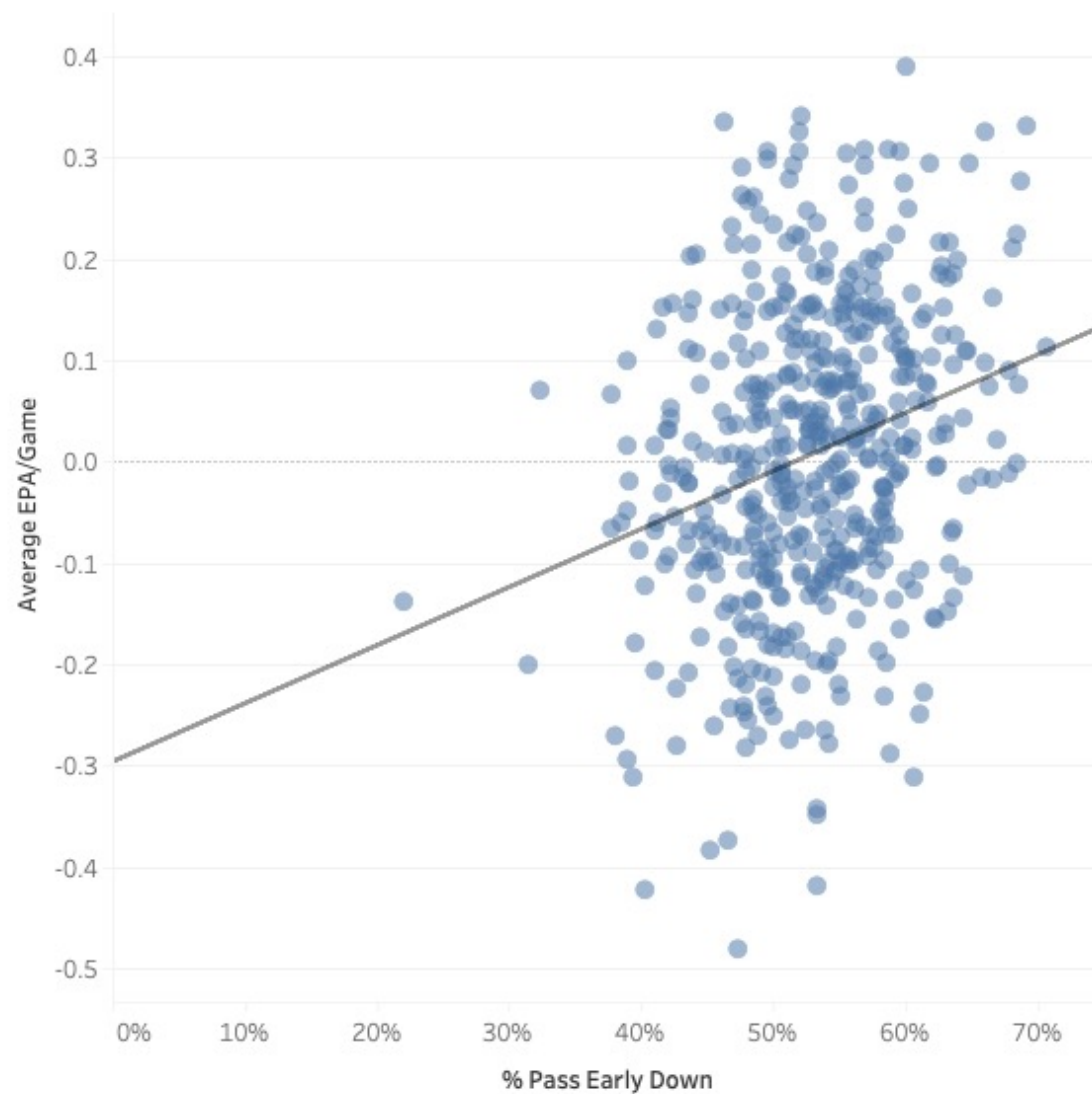
APPENDIX I

Average Rushing Yards Gained by Play Direction (Red Zone)



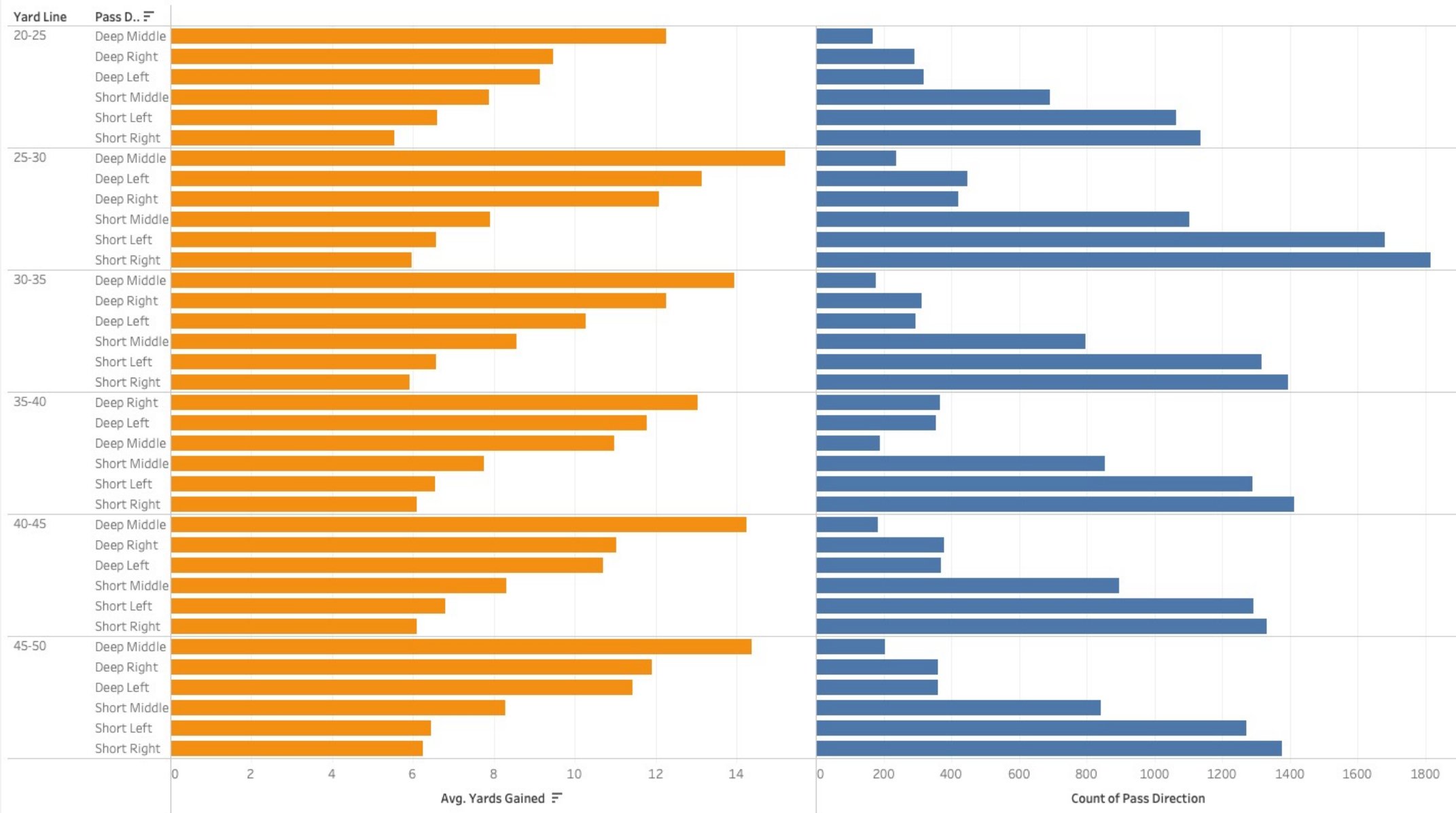
APPENDIX 2

Average EPA/Game by Early Down Pass Rate



APPENDIX 3

Average Passing Yards Gained by Play Direction



APPENDIX 4

Average Pass Yards Gained by Quarter and Play Direction

